GOVERNMENT OF INDIA
SCIENCE AND TECHNOLOGY
LOK SABHA

UNSTARRED QUESTION NO:961
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Technology Development in CSIR
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Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether technology development activities are undertaken regularly in the different laboratories of CSIR;
(b) if so, the details thereof;
(c) whether the Government has prepared any action plan to establish a coordination among the research technology of CSIR, the Start up India and Make in India scheme announced by the Government; and
(d) if so, the details thereof?

Answer

MINISTER OF STATE FOR SCIENCE AND TECHNOLOGY AND EARTH SCIENCES

(SHRI Y.S. CHOWDARY)

(a) Yes, Madam.

(b) The Council of Scientific and Industrial Research (CSIR), known for its cutting edge R&D knowledgebase in diverse S&T areas, is a contemporary R, D & E organization. CSIR covers a wide spectrum of science and technology − from radio and space physics, oceanography, geophysics, chemicals, drugs, genomics, biotechnology and nanotechnology to mining, aeronautics, instrumentation, environmental engineering and information technology. It has been providing significant S&T knowledgebase and technological intervention in many areas needed for the socio-economic development in the country. Further, CSIR's role in S&T human resource development is noteworthy.

As a result of concerted R&D efforts, CSIR today is globally benchmarked organization. According to the Scimago Institutions Ranking World Report 2014, CSIR is ranked at 84th among 4851 institutions worldwide and is the only Indian organization among the top 100 global institutions. CSIR holds the 17th rank in Asia and leads the country at the first position.
CSIR is a leader in terms of filing and securing patents worldwide, amongst its peers in publicly funded research organizations in the world. On an average CSIR files about 250 Indian patents and 250 foreign patents per year. The number of patent applications filed by CSIR in India and abroad during the last four years is given below:

Patent Applications Filed by CSIR
India Abroad
2011-2012 197 290
2012-2013 200 367
2013-2014 266 342
2014-2015 308 392

CSIR has been commercializing its innovations. In doing so, CSIR has been licensing technologies and products developed to industry. CSIR is successful in achieving 13.33% commercialization of its patents in comparison to a global average of 3%.

CSIR has developed technologies for:food and food processing; water; healthcare; building and construction; environment and sanitation; rural roads; cultivation and processing economic plants; farm machinery; leather; glass, ceramics and pottery; metals, mining and materials; aerospace; strategic sector etc. The CSIR has been continuously striving to address the unmet needs through its unique S&T interventions. The technologies so developed have been gainfully utilized in several states across the country.Some recent achievements of the CSIR are provided in Annexure-1.

(c)&(d) The Government has released a 'Startup India Action Plan' on 16th January, 2016. Incubators identified can verify whether a Startup is covered as specified in the definition. No specific role has been identified for CSIR.

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Annexure-1

Some Recent Achievements of the Council of Scientific and Industrial Research (CSIR)

â€¢ CSIR has made great headway in developing niche aerospace technologies. CSIR and the India Meteorological Department (IMD) are jointly producing the Drishti system, a visibility measuring system that provides information to pilots on visibility for safe landing and take-off operations, so as to enable the deployment of 70 such systems at Indian airports. About 23 systems have already been installed in 6 major Indian airports. CSIR−NAL has received the 'Make in India Excellence Award 2015' for Drishti under R & D

category.

â€¢ DHVANI - Detection and Hit Visualization using Acoustic N-wave Identification system has been developed by CSIR for perfecting marksmanship skills by accurately determining the location of bullet impact and providing real-time feedback. After rigorous field trials at Army ranges in Bengaluru, Secunderabad, and Infantry School Mhow, the well validated training system has been approved for induction into the Indian Army.

â€¢ CSIR through its New Millennium Indian Technology Leadership Initiative (CSIR-NMITLI) has been successful in developing a reflectance confocal microscope with supercontinuum light source. The development has paved way for India's presence in global photonics research. This is a World Class 'Made in India' High-end Product.

â€¢ CSIR based on substantial experimental and simulation studies with feedstock provided by M/s Reliance Industries Limited (RIL) and demonstrated that US grade gasoline and pure benzene can be simultaneously produced from a FCC C6 heart cut stream using extractive distillation (ED) route with aqueous NMP as the solvent. The gasoline thus produced has sulphur content <10ppm and benzene <0.3%. The technology has been transferred to RIL for commercialization.

â€¢ A novel technology for recovery of Sulphate of Potash (SOP) from bittern has been developed by CSIR and transferred to industries. The SOP is a premium fertilizer with highest nutrient value of ~68%. Presently entire potash demand is met through imports. The commercialization of the indigenous technology would make our country self-sufficient in sulphate of potash.

â€¢ As part of efforts towards developing sustainable energy solutions, CSIR under the CSIR-NMITLI, has successfully developed indigenous know-how to make technology components and the process for building Proton Exchange Membrane Fuel Cell (PEMFC) multi-cell stack of desired power output. CSIR has earlier developed stack-to-system level and is now scaling-up the system power produced to 3.5 kW and validating it for a commercial application such as telecom tower power backup. For this, a modular test bed has been designed, built and commissioned with in-house knowhow at Reliance Industries Ltd (RIL), Patalganga site. The fuel cell facility commissioned now, is expected to provide plenty of useful data for testing and developing indigenous fuel cells at low costs for commercial applications.

â€¢ Plastics consumption in India is reported to be around ~10 MMT (2010) while plastic wastes in India are ~15,000 TPD amounting to high environmental pollution. As a potential solution to address the growing menace of plastic usage and the associated waste generation in the country, CSIR has developed a facile process for the conversion of waste plastics (polyolefins) to value added hydrocarbons e.g. gasoline, diesel and aromatics. The process is simple, pollution free and environment friendly.

â€¢ Application of biofuels for aviation is an effective means for the aviation industry to reduce its carbon footprint. CSIR has developed a process as well as a catalyst to produce jet fuel based on biomass-derived non-edible oils such as jatropha oil. The bio-jet fuel has been able to match all the major specifications for aviation fuels such as petroleum derived jet fuel.

â€¢ CSIR has developed micro-channel reactors with stable catalyst coating formulations that are used to intensify the processes involving vegetable oils. These reactors have great impact on the product yield and conversion in hydro-processing of vegetable oils. CSIR has used the micro-channel reactors to convert non-edible oil and biomass-derived oil (pyrolysis-oil), biomass-derived gases (syn-gas) and coal derived gasses (coal gasification to syn-gas) into second and third generation biofuel.

â€¢ A Mobile Pilot Plant for Toxic Emission Monitoring and Control has been developed by CSIR for undertaking flue gas emission monitoring and control studies in various industries including Small and Medium Scale Industries (SMEs). Flue gas comprising of dust of different sizes and gases of varying concentrations representing different small scale industries such as ceramic kilns, hot mix plants, other small scale industries etc. will be monitored for its emission characterization.

â€¢ CSIR has set up a Micro Air Vehicle Aerodynamics Research Tunnel (MART) at the CSIR-National Aerospace Laboratories (CSIR-NAL) campus, Bengaluru. The tunnel, first of its kind in India, will be used to test the fixed-wing, flapping-wing and rotary-wing MAVs in the 500 mm wingspan category. The tunnel was set up under the National Programme on Micro Air Vehicles (NP-MICAV). The project is jointly coordinated by CSIR, the Defence Research & Development Organization (DRDO) and the Department of Science & Technology. The state-of-the-art tunnel would address all the aerodynamic, propulsion and aero-elastic issues related to MAVs.

â€¢ CSIR has been a consistent comrade of the ISRO and DAE. Its unstinting strong R&D support to the strategic sector has been most beneficial to the country. Gyrotron, a device used in nuclear fusion process, is currently imported in the country. Countries that manufacture gyrotrons namely the United States, Russia, Japan, and European Union do not disclose their designs and associated technology. Through focused efforts, CSIR with the Department of Science and Technology (DST) has developed the first Indian gyrotron which is ready to be tested at the Institute for Plasma Research (DAE), Gandhinagar, which is a partner institute on this project.

â€¢ CSIR has also been providing support in the development, production and supply of neodymium doped phosphate laser glass to the Raja Ramanna Centre for Advanced Technology (DAE).

â€¢ CSIR has been contributing in the area of healthcare. Some recently developed technologies/interventions benefitting the common people include: Streptokinase (a drug for cardiovascular disease); Risorine (a cost effective bioavailability enhanced anti-tuberculosis drug); Battery operated hand-held MicroPCR (towards affordable and point of care disease diagnostics for Tuberculosis, Malaria, Dengue, Chikungunya, Hepatitis B and H1N1); nonClonableID technology for medical product authentication; Diagnostic system for affordable, point of need testing to manage HIV and TB; Novel molecular diagnostics for eye diseases; and e-Health Center (eHC, a platform for the fourth paradigm of science, data-intensive discovery, while bringing affordable healthcare services to the doorstep of people). CSIR has recently developed a novel, safe poly-herbal formulation BGR-34 as a safe hypoglycaemic agent

for management of diabetes conditions which has recently been commercialized by an industry.

â€¢ Plasma gelsolin, a circulating actin-binding protein serving a protective role against tissue injuries is fast emerging as a health condition biomarker. Depletion of plasma gelsolin in systemic inflammation contributes to adverse outcomes. CSIR has developed two mass-production ready plate based kits to estimate plasma gelsolin levels in humans. While, most other labs including commercial set-ups are focusing on improving bulk production of this protein, CSIR has developed bonsai versions of this protein by structure-based insights and has successfully demonstrated the anti-sepsis properties of the miniaturized versions in LPS-induced sepsis model of mice. The kits thus developed will help in determining a quantitative measure of sepsis. The laboratory is also testing the kits viability in predicting cases of preterm birth.

â€¢ Under GUaRDIAN, a one of its kind research programme, CSIR is focused at the development of genomics based diagnostic tools for understanding rare diseases. The programme with extensive collaboration between clinicians and researchers is targeted at better understanding the genetic basis and molecular mechanisms of rare genetic disorders using advanced genomic technology. The findings pave way to newer diagnostic methods such as exome sequencing based tools which could be an alternative to traditional gene sequencing approach to quickly identify the variations and be able to make an appropriate diagnosis in clinical settings.

â€¢ Further, a national cGMP facility for extraction, formulation and packaging of traditional herbal medicines has been set up at CSIR-Indian Institute of Integrative Medicine (CSIR-IIIM), Jammu. It has been created as per WHO guidelines. The facility will also be made available to R&D institutions and industry. The facility will target preparation of extracts and formulations for conducting clinical trials, process development, scale-up & optimization of lab- processes and converting them into commercially viable technologies besides generation of authentic and accurate clinically acceptable data. This facility will transform quality herbal drug production in India and its export to US and European markets.

â€¢ CSIR has developed a number of technologies on water, ranging from source finding to mapping of water resources, from quality assessment to enhancing potability of water and from recycling to waste water treatment. The technology for community scale RO desalination plants has been developed. The RO plants in various states (Rajasthan, Tamil Nadu, Delhi, West Bengal, Gujarat etc.) have been set up based on the technology. Further, technology for arsenic removal from water has been developed and based on the same common people have benefitted in the state of West Bengal. Also high flux hollow fibre membrane based technology for water disinfection and purification at affordable cost has been developed and is being used at commercial level.
â€¢ CSIR has developed KrishiShakti, a small range (11.2 hp) diesel engine tractor. The technology of the same has been transferred and manufacturing has been initiated in West Bengal. The tractor was launched in Delhi on 20th November 2014. During the launch five tractors were handed over to farmers. The KrishiShakti has enabled farmers with small land holdings for effective tilling.

â€¢ A cost effective and efficient anti tarnishing lacquer has been developed for brasswares, helping the Moradabad brass cluster. The developed lacquer is very efficient to prevent tarnishing for long durations. Also, energy efficient brass melting furnace has been developed which is smoke-free coal furnace, handles more charge (brass melt), reduces gas emission and pollution by 80% and consumes 20% less coal. It is user friendly as artisans can adopt this furnace without changing their current practices and like the present furnace, this modified version can also be repaired by the artisans. The knowhow has been transferred for commercial use.

â€¢ CSIR has developed an indigenous substitute of Ukraine clay in granito ceramic tiles which has reduced the Ukraine clay requirement from 20% to about 1%, reducing thus the foreign material import and associated costs. This has made major economic difference and benefitted small and medium scale enterprises in Gujarat.

â€¢ A food processing unit has been set up at CSIR-Centre for High Altitude Biology (CSIR-CeHAB) in the remote tribal region of Lahaul and Spiti. A brining unit has been designed and prototype developed for the preservation of locally and abundantly produced peas and cauliflowers. The knowhow was showcased at the District level Tribal Fair at Keylong and training organized for the benefit of progressive farmers in the area of food and food processing: making novel products from Buckwheat; and also brining of the peas which is a major crop.

â€¢ CSIR has worked with the Indian Council of Agricultural Research (ICAR) for the development of highly priced rice variety, Samba Mahsuri, resistant to the serious Bacterial Blight (BB) disease. This new variety called, improved Samba Mahsuri has been released for commercial cultivation and is being very much appreciated by farmers growing rice.

â€¢ CSIR in collaboration with Rice Research Station, Chinsurah, West Bengal has developed novel low grain arsenic accumulating rice genotype. The variety which is named as "Muktashree" will be soon released for cultivation in vast arsenic affected belts of West Bengal.
â€¢ A novel variety of Ashwagandha with high root yield of 15 quintal/hectare has been developed and released to farmers which would help farmers with more earnings. The Ashwagandha has useful applications in pharma applications as anti-inflammatory, anti-stroke and anti-arthritis drug adjuvant.

â€¢ CSIR has developed a new variety 'CIM-Jyoti' of Ocimum through intensive breeding efforts for high yield of herb and essential oil with desirable quality of higher citral (68-75%). This variety will produce citral in a short duration of 70-80 days. It also fits in crop rotation/intercropping between wheat and paddy and with other vegetable crops of small farmers. Leaves of this variety can also be used in lemon tea.

â€¢ The people of North East India make a number of leather products but they were unable to reach the market and earn desired profit due to lack of aesthetic appeal and standardisation. There was a need to transform this knowledge into wealth by increasing the value of the products without losing its real essence. CSIR carried out a comprehensive survey in the north eastern region. Based on the inputs from the survey, new ranges of products were developed. The handbags are crafted and designed with the ethnic materials of the northeast and the inspirations are derived from Ornaments, Dresses & Artifacts adorned by tribal folks of the northeast India.

The products were displayed in various national/ international fairs and have attracted many enquiries. This has benefited the women entrepreneurs of North Eastern region.

â€¢ CSIR has set up post-harvest centres in Mizoram (Aizawl) and Arunachal Pradesh (Pashighat). These centres are focused at helping the local farmers in the region for value addition to their agricultural produce. The centres house technology for high efficiency drying and processing of ginger, cardamom, turmeric, chilies etc. The farmers are able to sell their produce at 20 − 25% higher price to the processing centres set up. The CSIR Post Harvest Technology Centres would generate direct employment to about 300 people.

â€¢ CSIR has introduced and commercialized Lilium cultivation in Lahaul and Spiti region of Himachal Pradesh. CSIR has played a catalytic role in the promotion of commercial floriculture in Himachal Pradesh. The transfer of agrotechnologyofLilium in the region was realized by the flower growers through sale of cut flowers at Delhi flower market. Over 3000 farmers are engaged in floriculture in Himachal Pradesh.
â€¢ CSIR has developed knowhow for easy cultivation of economically important seaweed, namely Kappaphycusalvarezii, which was disseminated to the fishing community in coastal regions of Tamil Nadu as supplementary activity to existing fishing activities. Presently, more than eight hundred Self-Help Groups (SHGs) are engaged in seaweed farming in the region. It provides a regular and sustainable income source for women, with each of them earning on an average Rs. 5000/- per month for a period of eight months in a year. CSIR has further developed integrated process for simultaneous recovery of two products from the harvested fresh seaweed, namely, hydrocolloid of commercial use and liquid biofertilizer for use by farmers.

â€¢ CSIR has been adopting villages to promote employment generation and income augmentation. It has thus catalyzed commercial cultivation of Geranium in Uttaranchal and Lavender in Jammu & Kashmir through community participation. In these end to end missions, farmers have been trained not only for cultivation of Geranium and Lavender but also for extraction of oil, augmenting thus their income. Likewise CSIR efforts through development of niche Mentha varieties and their propagation for mass cultivation are noteworthy. The efforts have led to economic growth and have enabled India to acquire a world leadership position in Menthol mint oil production and export.

â€¢ CSIR efforts for socio-economic development had led to: empowering people of the Kashmir Valley through creation of aromatic plant industry; development of bio-inoculants for enhancing plant productivity and its dissemination to the farmers in Uttar Pradesh in the partnership with the State Government on a very large scale and it has enhanced agriculture productivity; and development of mushroom technology, its transfer and training which has benefitted economically the rural women in North East States. CSIR has also launched the Jammu Aroma Arogya Gram (JAAG) Yojana for deployment of CSIR agri-technologies and handholding the farmers of J&K for cultivation of medicinal and aromatic plants in the state.

â€¢ CSIR has conducted the analysis, designing and structural detailing of (G+1) reinforced concrete buildings using Expanded Polystyrene (EPS) Panels. The salient features of the technology are: faster mode of construction; ideal for mass production of houses; affordable; and disaster resistant - cyclone wind loads. The developed technology has been transferred to Consortium Transmission Systems Pvt. Ltd. (CTSPL), Hyderabad for 'Hudhud' cyclone victims' rehabilitation housing programme at Srikakulam, Andhra Pradesh.